Project	**IEEE 802.16 Broadband Wireless Access Working Group**
Title	**Proposed Revision to Section B.3 (SC PHY Link Budget Analysis)**
Date Submitted	**2002-01-04**
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Re:	Proposal to revise Section B.3 of document IEEE P802.16a/D1-2001 with provided text.
Abstract	The Link budget given in Tables 265 and 266 are being revised in Section B.3 of document IEEE P802.16a/D1-2001. This contribution simplifies and merges two tables into one with mc accurate results.
Purpose	Incorporate provided text as revision of Section B.3 of document IEEE P802.16a/D1-2001.
Notice	
Release	
Patent Policy and Procedures	

Revision of SC PHY Link Budget Analysis

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Introduction:

The objective of this contribution is to present a typical link budget for single carrier systems with parameters close to a feasible scenario for Uplink and Downlink transmission and reception. In the existing Appendix B.3, there are two Link budget tables with some redundant information that are being reduced into one table only. Therefore, we propose to replace Section B.3 of the existing document with the following section.

B.3: SC PHY LINK Budget Analysis

This annex is informative only.

A complete link budget analysis was performed by combining various channel bandwidths and QAM constellations with the channel models found in [B64]. An example of the path loss versus propagation radius for category C of the propagation model in [B64], assuming a 30 m BS antenna and 6.5 m SS antenna, is shown in Figure 248. For reference, an example set of parameters that fully specify model categories A, B, and C in [B64] are listed in Table 264.

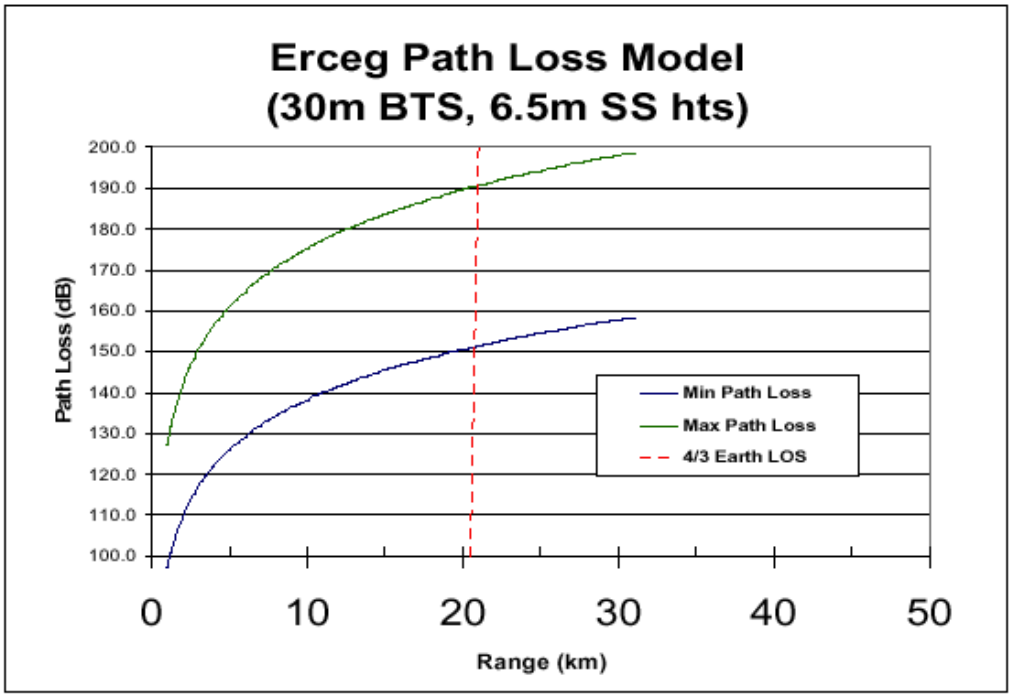

Figure 248 Path Loss Model

Table 264 Sample set of parameters for A, B, and C channel model categories

Parameter	Category		
	C	B	A
	Flat, few Trees	Intermediate	Hilly, heavy trees
a	3.6	4	4.6
b	0.005	0.0065	0.0075
c	20	17.1	12. 6
Channel Frequency (GHz)	2.5		
Wavelength (m)	0.12		
SS RX antenna height h (m)	6.5		
BS antenna height h_{bs} (m)	80		
$y=(a-b\ h_b+c/h_b)$	4.116667	4.375	4.795
$A = 20\log(4\pi d_0/\lambda)/\log(10)$	80.40057		
s	9.4		
$PL = A + 10\gamma\log(d/d_0)/\log(10) + DPI + DPh \pm s$			
4/3 Earth Line of Sight (km)	32.5		

Using the parameter settings for Category C of Table 264, median path losses can be generated. Evaluating these path loss figures as a function of distance, the minimum path length necessary to reliably deliver QPSK and 16QAM, on both an UL (1.5 MHz channel) and DL (6 MHz channel), were compute. Table 265 captures the results of these calculations, for a typical SC system. These results assume that SC system have the same CINR requirements for QPSK and 16-QAM at their receivers.

Table 265 Typical Link Budget for SC system with 16QAM Downlink (6 MHz) and QPSK Uplink (1.5 MHz).

	Single Carrier Systems	
Bandwidth	**6.0** MHz	
Modulation type / Target SNR with FEC gain	**16QAM** 14 dB	
Downstream		
EIRP (BTS)	43.0 dBm	20 w
Antenna Gain	13.0 dB	
Back off	10.0 dB	
Nominal 1 dB compression point	40.0 dBm	**10 w**
Path distance for targeted SNR	**7.0 km**	
Associated Path Loss (from 802.16.3c-29r1)	-145.0 dB	
Receive Antenna gain	18.0 dB	
Power at Input to Receiver	-84.0 dBm	
Receiver Noise Figure	5.0 dB	
Equivalent Noise Power in channel BW	-101.2 dBm	
SNR, Calculated	**17.2 dB**	
Bandwidth	**1.5** MHz	
Modulation type / Target SNR with FEC gain	**QPSK** 12 dB	
EIRP (SS)	34.0 dBm	3 w
Antenna Gain	13.0 dB	
Back off	5.0 dB	
Nominal 1 dB compression point	26.0 dBm	**0.40 w**
Path distance for targeted SNR	**4.5 km**	
Associated Path Loss (from 802.16.3c-29)	-137.1 dB	
Receive Antenna gain	16.0 dB	
Power at Input to Receiver	-87.1 dBm	
Receiver Noise Figure	4.0 dB	
Equivalent Noise Power in channel BW	-102.2 dBm	
SNR, Calculated	**15.1 dB**	